

## CLAIMS

1. A method for the stabilisation and disposal of elemental mercury, said method comprising treating the elemental mercury with a cementitious particulate filler material, wherein said method additionally comprises an immobilisation treatment.  
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2. A method as claimed in claim 1 wherein said immobilisation treatment comprises a stabilisation treatment comprising sulphur stabilisation, sulphur polymer stabilisation/solidification or the formation of a chemically bonded phosphate ceramic.  
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3. A method as claimed in claim 1 wherein said immobilisation treatment comprises an amalgamation process.  
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4. A method as claimed in claim 1 or 3 which comprises:
  - (a) treating elemental mercury with an amalgamating metal; and
  - (b) treating the resulting amalgam with a cementitious particulate filler material.  
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5. A method as claimed in claim 3 or 4 wherein said amalgamation process comprises treating elemental mercury with an amalgamating metal and a dilute aqueous acid.  
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6. A method as claimed in claim 5 which comprises:
  - (a) treating elemental mercury with an amalgamating metal and a dilute aqueous acid;
  - (b) subjecting the resulting mixture to vigorous agitation to form an amalgam sludge;  
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- (c) adding a cementitious particulate filler material to the amalgam sludge with stirring; and
- (d) allowing the resulting mixture to cure.

- 5     7.     A method as claimed in any one of claims 4 to 6 wherein said amalgamating metal comprises copper, silver, gold, zinc or tin.
8.     A method as claimed in claim 7 wherein said amalgamating metal is copper.
- 10    9.     A method as claimed in any one of claims 4 to 8 wherein said amalgamating metal is provided in the form of a fine powder.
10.    A method as claimed in any one of claims 3 to 9 wherein the ratio of mercury to amalgamating metal is between 1:4 and 1:1 w/w.
- 15    11.    A method as claimed in claim 10 wherein said ratio is in the region of 2:3 w/w.
12.    A method as claimed in any one of claims 5 to 11 wherein said dilute aqueous acid comprises a dilute aqueous mineral acid.
- 20    13.    A method as claimed in claim 12 wherein said dilute aqueous mineral acid comprises dilute nitric acid.
- 25    14.    A method as claimed in any one of claims 5 to 13 wherein the acid concentration is in the region of 1M to 0.01M.
15.    A method as claimed in claim 14 wherein said acid concentration is around 0.1M.

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16. A method as claimed in any one of claims 5 to 15 wherein the acid is present at a ratio of 1:2 to 2:1 w/v in relation to the amalgamating metal.
17. A method as claimed in claim 16 wherein said ratio of acid to amalgamating metal is 1:1 w/v.
18. A method as claimed in any one of claims 3 to 17 wherein agitation of the amalgamation reaction is discontinued after a period of less than 15 minutes.
19. A method as claimed in claim 18 wherein the agitation is discontinued after 5-10 minutes.
20. A method as claimed in any one of claims 3 to 19 wherein additional water is added to the mixture during the addition of the cementitious particulate filler material to the amalgam sludge in order to preserve the consistency of the mixture throughout the addition process.
21. A method as claimed in any one of claims 3 to 20 wherein the cementitious particulate filler material is added to the amalgam sludge in a ratio of from 4:1 w/w (cementitious material to amalgam) to 1:2 w/w.
22. A method as claimed in claim 21 wherein said ratio is from 3:1 w/w to 1:1 w/w.
23. A method as claimed in claim 22 wherein said ratio is around 1:1 w/w.
24. A method as claimed in any one of claims 1 to 23 wherein said cementitious particulate filler material comprises Ordinary Portland Cement (OPC).
25. A method as claimed in any preceding claim wherein said cementitious material comprises at least one additional filler.

26. A method as claimed in claim 25 wherein said at least one additional filler comprises at least one additional inorganic filler.
- 5 27. A method as claimed in claim 25 wherein said at least one additional filler comprises pulverised fuel ash, hydrated lime, finely divided silica, limestone flour or organic and inorganic fluidising agents.
28. A method as claimed in claim 25 or 26 wherein said at least one additional filler comprises Blast Furnace Slag (BFS).
- 10 29. A method as claimed in any one of claims 25 to 28 wherein said cementitious material comprises additional filler and cementitious particulate material in a ratio of from 5:1 to 1:1 w/w.
- 15 30. A method as claimed in claim 29 wherein said ratio is in the region of 3:1 w/w.
31. A method as claimed in any preceding claim wherein the resulting mixture is allowed to cure at ambient temperature.
- 20 32. A method as claimed in any preceding claim wherein the resulting mixture is allowed to cure for a period of around 24-48 hours.
- 25 33. A method as claimed in any preceding claim whenever applied to the safe disposal of elemental mercury which is contaminated with radioactive materials.